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The Ogievetsky-Polubarinov massive gravity and the benign Boulware-Deser mode

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Abstract

© 2018 IOP Publishing Ltd and Sissa Medialab. We present our analysis of the theory constructed in 1965 by Ogievetsky and Polubarinov (OP) - the first ever theory of interacting massive gravitons. Its mass term is adjusted in such a way that the non-linear field equations imply as a consequence the linear Hilbert-Lorentz condition, which restricts the spin of states in the theory. Strikingly, for special parameter values this theory coincides with one of the "ghost-free" massive gravity models rediscovered only in 2010. For generic parameter values, however, it propagates 6 degrees of freedom and shows ghost around flat space. Surprizingly, we find that the de Sitter space remains stable for a large region of the parameter space, provided that the Hubble expansion rate is large enough, hence the Boulware-Deser mode is benign in this case. We study also other solutions and find that the Milne universe - a sector of Minkowski space - is stable in the UV limit. This presumably implies that at the non-linear level the ghost instability in flat space develops only for long waves, similarly to the classical Jeans instability.

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Keywords

cosmology of theories beyond the SM, dark energy theory, gravity, modified gravity

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